

- b. Width of fruit exceeding the height by 0.2 mm. (Fig. 2b);
face of mericarps nearly flat (Fig. 2c).
- c. Fruit mostly 0.7 mm. or more wide, on pedicels 0.5–4 mm.
long.....*C. deflexa* var. *deflexa*.
- c. Fruit mostly 0.5–0.7 mm. wide, on pedicels 0.1–0.3 mm.
long.....*C. deflexa* var. *subsessilis*.
- a. Plants aquatic or subterrestrial, of diverse habit and foliage
(Plate 1168); stem and leaves usually with scattered stellate
scales (Figs. 17c, 17d); stamens elongating as the fruit ma-
tures, to 1.5–3 mm.; anthers 0.3–1.5 mm. wide; flowers
usually with 2 whitish inflated bracts at base.
- d. Carpels not winged.
- e. Fruit 0.7–1.2 mm. wide, the height equalling or slightly
exceeding the width (Figs. 12a, 12c, 17a).
- f. Fruit 0.7–1.2 mm. wide, usually of equal width above
and below the middle (Figs. 17a, 17e).....*C. nubigena*.
- f. Fruit 1.2–1.4 mm. wide, usually a little the widest above
the middle (Fig. 12c).....*C. heteropoda*.
- e. Fruit 1.4–1.5 mm. wide, a little wider than high (Fig. 14a)
.....*C. quindiensis*.
- d. Carpels wing-margined.
- g. Wing not extending around base and apex of each meri-
carp.
- h. Fruit sessile or nearly so; wing well-developed at sum-
mit and sometimes base of the carpel, narrower or
absent down the sides (Fig. 11a).....*C. albomarginata*.
- h. Fruit sessile or pedicelled, sometimes both on the same
plant; wing of equal width around the carpel.
- i. Fruit 1.0–1.4 mm. wide, usually wider than high
(Figs. 18a, 18d, 18g).
- j. Fruit sessile or nearly so.....*C. Lechleri* var. *Lechleri*.
- j. Fruit pedicelled.....*C. Lechleri* var. *Berteroana*.
- i. Fruit 0.7–0.9 mm. wide, higher than wide (Fig. 20c)
.....*C. oblongicarpa*.
- g. Wing extending around the base and apex of each meri-
carp (Fig. 22b).....*C. rimosa*.

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PROBLEMS IN INDICATING PLANT DISTRIBUTION

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I THINK that Fernald partly answered his query, "Why so many careless books on trees and other plants" (Rhodora 52: 272) in his first sentence: "Everyone is interested in trees." Without attempting to present statistics I would venture that many hundreds of books have been written about trees and most of them are somewhat popular in nature. The distribution of trees has been a matter of much interest and maps for this have been used in many handbooks.

It must be apparent that the mapping of distributions involves two problems: (1) basic information; (2) method of presentation. We are aware of shortcomings in our knowledge but have no adequate inventory of them. Little has been done in the exploration of better methods of presentation.

Anyone who has made a careful study of any species of plant has found errors in the information previously available. Often these errors have been relatively apparent when brought to attention but have been quoted repeatedly without an attempt at verification of the facts. The reasons are not difficult to find. Each worker makes only a small contribution to the advancement of knowledge. He must depend upon earlier work, for, if each were to begin at the beginning, little advancement could be made.

Few people, if any, are familiar with all facts on the distribution of a single species, not to mention the large number of species discussed in a handbook. No one has access to all of the published material, much less to that which is unpublished. If one attempts to make a full survey of it for even a few plants he soon is bogged down in the details of this endeavor. It is not surprising that most authors have contented themselves with the "most pertinent" literature and ignored the rest.

The preparation of a distribution map involves much effort and expense. Once made it is easily copied. It is far easier to criticize than to present something that will have a high degree of acceptability. A dot on a map may indicate the source of a definite specimen, but what does it tell of the abundance of the species? A line may indicate the approximate limit of distribution but over the greater part of the distance the position of this line must be somewhat arbitrary. One who is familiar with the alleged boundary at any point is likely to find fault with its position. Rarely are the data sufficient to form an undebatable line.

The problem of delimiting is difficult in marginal areas. Distributional maps for a species have usually employed a limiting line, a solid or cross-hatched figure. Maps of population, agricultural or natural products, manufactures, etc., usually employ a graded series of characters. The data for these are relatively exact while those for plant populations are quite otherwise in most cases.

Reference was made to maps in a particular book on trees. The map of forest areas was taken from the Forest Service and should have been as good as any that could be used. I had submitted to the author a list of suggested changes in species maps so far as North Dakota is concerned. *If* he received a sufficient number of such lists, *if* they were reasonably in agreement and *if* the economics of publication permitted, new maps could be made for a later edition.

Mapping becomes difficult in the border areas where a species may be limited to small, scattered places where conditions are favorable. Along the western edge of the forested region small areas of trees, especially where deep, sheltered ravines occur, allow true forest herbs to persist. A gradual thinning out of dots or lines would seem to show this to best advantage, but this does not serve well for small scale maps.

Perhaps a better treatment for small scale maps would be an outline of the area with occasional dots to represent records near the boundary both in the area and beyond it. This should help convey the idea that the limit is only approximate, since readers are likely to place variable interpretations upon reports of material with which they are not familiar.

The use of a solid black area gives a bold impression, but to the mind of the present writer it is entirely too bold and accentuates the errors as well as the facts. Such a map for *Populus deltoides* (Collingwood,—Knowing Your Trees—adapted (?) from U. S. D. A. Misc. Publ. 287 in which distribution patterns of the trees followed along more or less imaginary streams) may give a quite erroneous idea of the distribution of this tree in North Dakota. Actually it is largely absent from the eastern and northern part of the State (as a native plant) and confined principally to the Missouri and Little Missouri River valleys.

Verbal outlining of the area saves labor and space but leaves the reader to picture the limits in his mind. When it reads "Wis. to Mont.", where would be the northern limit? Most readers will be familiar with political boundaries but not with ecological ones. The ecologist is probably less concerned with the overall distribution than with local associations. The marginal areas are even more troublesome by the descriptive method.

The Seventh edition of Gray's Manual had such generalized statements of range that it was difficult to suggest changes except to ask for more definite ones. Now with those given in the Eighth edition further suggestions are more easily offered.

Treatment of familiar naturalized species is much curtailed and this is understandable but these plants are important as weeds. *Cannabis sativa*, "chiefly sporadic, Que. to B. C. and southward," gives no hint that it is well established and reaches a northern limit somewhat south of North Dakota. *Abutilon Theophrasti*, *Plantago lanceolata* and *Cichorium Intybus* are in a similar position.

I had submitted a North Dakota specimen of *Fraxinus nigra* but the new range, "Man., N. D." might suggest the entire State to some people. To those who are somewhat familiar with tree distribution in general it might mean eastern North Dakota. Actually it is a small area in the northeast. Perhaps it would be better to omit the State where only one or two records are known as for *Fraxinus nigra* and *Ulmus rubra* in North Dakota at least unless the qualifying "e", "ne", etc. are used.

Fernald was of course less familiar with the plants in the western edge of the Manual's range and was not as interested in that area as he was in New England. I find it hard to understand, however, that he should not have given more attention to the relatively few publications which cover the western border and also to the broad distributional features of that section. One of the latter which I believe has received little attention is the northern wedge between the Missouri River and the Red River of the North. *Rorippa sinuata*, *Lythrum alatum*, *Specularia leptocarpa*, *Dyssodia papposa* and even *Solanum rostratum*, are some of the plants which are lacking in this triangle though found farther north to the westward—the northern border of the upper Austral Zone.

North Dakota is beyond the range covered by the Manual and thus little detail of its flora could be considered. Minnesota however, is commonly indicated in the extension of species only as "Minn." The floras of its southern Mississippi Valley, southwestern prairie and northern forest are so different that a more frequent use of se, sw, and ne would have much increased the informational value to readers who are unfamiliar with existing conditions.

Ribes odoratum provides an example of a need to check original source material. The range given in the Manual, "S.D. east to Minn." was apparently taken from Berger (Cornell Tech. Bull. 109) and was inaccurate. The plant is frequent in western North Dakota and extends slightly into Saskatchewan. It does not occur east of the Missouri River and is "probably not native anywhere in Minnesota" (Rosendahl, Trees and Shrubs of Minn.). Incidentally, why did this shrub, which becomes almost a weed when planted, remain in such a limited area?

The above remarks may seem adverse comments on the new manual. They are intended as comments on a problem in which I have long been interested. The citations serve to illustrate the difficulties of interpretation by readers of what may seem apparent to the author and of some of the pitfalls which beset the author.—DEPARTMENT OF BOTANY, NORTH DAKOTA AGRICULTURAL COLLEGE, FARGO, NORTH DAKOTA.

PERLUSTRATIONES PLANTARUM ARCTICARUM

I(*bis*).¹ ARCTIC DICOTYLEDONOUS SPECIES: FOUR
NEW NAMES OR COMBINATIONS

NICHOLAS POLUNIN

FOR more than a decade the writer has been gathering material and assembling notes for a circumpolar treatment of all the species of vascular plants which are known to occur north of the southern boundary of the Arctic as he has delimited it for this and allied purposes.² The original intention was to produce little more than a check-list, but in deference to requests for a more usable treatment the project has now grown to include *for each species* range-citations as far as known within the Arctic, mention of its most characteristic habitat or habitats, English names as well as any synonyms that are considered necessary for reference to arctic literature, and, in addition, sufficient descriptive data for characterization or at least separation of all the families, genera, and species involved. So far, approximately all of the genera and

¹ The initial paper in this series was published in the *Journal of Botany*, LXXX, pp. 81–94, "May 1942," the gap in time and interpolation of this contribution, being due to the cessation of publication of that periodical after acceptance of further instalments (designated II, III, IV, etc.) which it is hoped shortly to retrieve for publication here.

² Cf. Proceedings of the Seventh International Botanical Congress, Stockholm, 1950 (in Press) and "The Real Arctic: suggestions for its delimitation, subdivision, and characterization," *Journal of Ecology*, vol. 39, 1951 (in Press).